THE LAND
TODAY AND TOMORROW

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SOIL EROSION SERVICE
U. S. DEPARTMENT OF THE INTERIOR

THE LAND
TODAY AND TOMORROW

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Looking Ahead

By H. H. Bennett
Director

The Director stresses the need for cooperation with other agencies as the Soil Erosion Service swings into a new and vital year_____

As we close the old year, with its well-worn paths of faithful effort and its record of useful accomplishments, and enter the New Year with its challenging tide of opportunities for an expanded service, I wish to express my deep appreciation to all my co-laborers for their loyalty and unflagging zeal in the important work that has been entrusted to the Soil Erosion Service; and I wish to pledge anew my continuing efforts in the administration of our Service organization on a basis of sound and fair procedure.

It seems appropriate at this time, to extend to the State Colleges of Agriculture, State Experiment Stations, the Extension Service and other State and Federal agencies, the very great appreciation of the Soil Erosion Service for the invaluable assistance given by these organizations in the inauguration of an extensive demonstfational-educational program of erosion prevention and control.

It is our feeling that the directing specialists of the organizations that have been so helpful must have realized the complexity of difficulties involved with the launching of such a far-reaching program. Without their timely and consistent help, we could not have accomplished the impressive progress that has been made. They have been particularly generous in making available for our Service some of their best trained personnel. Our difficulties would have been almost insurmountable if this spirit of helpful cooperation had not been accorded us, and we are deeply grateful.

We recognize the principle of cooperation as a fundamental part of our program. We greatly desire to render helpful service wherever we can, and we know that the degree of successful accomplishment in our field operations will reflect the quality and character of our cooperative relationships. We must have the confidence, sympathy, and

active support not only of the farmer on whose lands we actually work, but of all purposeful individuals, organizations, and associations interested in the preservation and wise maintenance of our indispensable farm land.

Looking ahead, the enormousness of the problem of land erosion with its far-flung economic and social ramifications, is a clear challenge to the combined abilities of all of us. There must be a loyal, willing cooperation on the part of all agencies that can make a useful contribution to the development of a nation-wide coordinated plan of land protection, which must be set up if we ever expect to curb the evil effects of destructive erosion and so save our remaining indispensable agricultural soils.

There is work for us all, plenty of it -- far more than can be done in any short period of time; but we can organize our combined resources of effort to the greatest possible advantage in bringing to the job all of those practical measures of erosion control that have been worked out by the Experiment Stations, the Colleges of Agriculture, the Federal Department of Agriculture, the Soil Erosion Service, and individuals, and apply them under a program of workable cooperation in accordance with the needs and adaptabilities of the many different kinds of land that make up this complex country.

Thus far the Soil Erosion Service has undertaken to achieve within the limits of its regional projects, the best possible job by employing all known practical erosion control measures regardless of their origin. Being supported by emergency funds, we have provided as much employment as could be advantageously used, and we have proceeded as rapidly as possible in getting our comprehensive program under way. Our life has been brief, but we feel that we have moved forward effectively, and the comments that have come to us from many parts of the country expressing commendation and approval, have enheartened and encouraged us.

It has been a great personal regret that I have not been able to get into the field more often. There simply has not been time to do so, nor has there been time to carry on a great deal of correspondence with those institutions that have contributed and must continue to contribute unceasingly to this national program in order that it may be of greatest benefit to the country.

Looking ahead, I want to express what is clearly the desire of everyone in the Soil Erosion Service: that nothing be left undone in effecting a closer relationship and a clearer understanding with each of the organizations and institutions referred to above. Recently, circular letters were sent to our regional directors urging the adoption of

plans for bringing about this closer and better association of ideas and efforts. It is my feeling that the earnest, capable men concerned will not fail in that highly desirable undertaking.

In addition, I would urge that these institutions and organizations give careful scrutiny to the work that has been done by our Service, and offer to us their helpful criticisms and constructive suggestions that we may incorporate them in our future planning. It is not an easy thing offhand to write out the precise details by which erosion-control work should be extended to all land needing treatment; nevertheless, precisely this must be done, and it is our hope that all of us will give serious thought to this very important matter, to the end that we may work out very definitely the best possible methods for accomplishing those essential things in the field of soil conservation that can not be omitted regardless of the position or inclination of any of us. The physical facts involved make it clearly obvious that we shall never get very far unless we make use of a coordinated program of land treatment, employing many different methods, separately or combined, according to their applicability. There is no need for arguing this point; it was settled when the world was created.

In the Soil Erosion Service, we have exerted every effort to train our specialists to think beyond and above their individual interests; to conceive themselves as parts of an integrated machine functioning to the limits of human capacity to protect the needs of the agricultural lands of the nation. In the hearts of our field laborers, we are striving to build the concept that every stroke of work performed in this gigantic undertaking, adds value to the land that represents our country's most indispensable resource. We are teaching these men, specialists and field laborers, to try to build into the hearts of every farmer with whom they come in contact a greater love for the land and a clearer understanding that this substance we call the soil is the primary source of life's necessities and comforts, and it is the most basic and essential of all of our God-given assets.

The course the Nation must pursue over its major areas, if this is to be a permanently productive agricultural country, is clearly marked out. If we refuse to conserve our agricultural lands, obstinately continuing with old methods that have failed, then we may as well confess that we have consciously chosen to head in the direction of disaster. Since posterity can not meet the task and since many farmers are utterly unable to handle all phases of the work that must be done, the responsibility of the Government and of the states is obvious. Aside from this responsibility, the Government has a definite and inseparable interest in the continuing welfare of its remaining

areas of good agricultural land.

It should not be overlooked that the physical facts involved show, also, that we can not have any large measure of permanency in our flood control operations and in our efforts to reduce the hazards of silting of stream channels and reservoirs until the problem of erosion, which is a problem of accelerated runoff of rain-water, is controlled on the watersheds all the way from the crest of ridges down to stream channels. Here again it is perfectly clear that there must be cooperation: programs of erosion control tied in with building levees, spillways and reservoirs, as well as with programs of farm management and wise land use.

And finally, why should there not be cooperation? Is there any physical obstacle in the way that can not be overcome? Or is there any organization objection that can not be smoothed out? I think not. The needs are too acute and the demands too urgent to invite any delay, or even possible defeat, through a lack of cooperative helpfulness on the part of the agencies concerned.

I want to go squarely and definitely on record for the Soil Erosion Service, that we believe in the fundamental principle of cooperation; that we will continue to offer and accept cooperative service; that we have no intention of usurping any field of operative effort; that we need all the help we can get in carrying through the gigantic job entrusted to us; that our minds are not closed to constructive suggestions; and that we are determined to do those things that are necessary to save the nation's remaining areas of good farm land.

It is felt that the Soil Erosion Service has something very pertinent to contribute to the problem of soil conservation, flood control, reduction of the problem of silting, and better land use; and, if others have anything of this same conception, it is our desire to dedicate our best efforts to the interests of the nation. Our work is on the land; it is under way and open to the visual inspection of everyone. We invite such inspection at all times; and we invite the criticisms, suggestions and cooperation of every thinking, patriotic citizen.

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REGIONAL DIRECTOR HEADS SCIENCE GROUP

W. A. Rockie, Regional Director of the Soil Erosion Service demonstration area near Pullman, Washington and Moscow, Idaho, has been elected president of the Northwest Scientific Association.

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Land Use and Erosion In the West

When pioneer cattlemen reached the Palouse, the bunchgrass was stirrup-high. Today, little remains in many sections except miles of sand and rock and sage... The famed "Johnson pasture" is an impressive relict of pioneer vegetation. This article is a tribute to the foresight of the original owner -- and a warning to others.

By A. L. Hafenrichter

CHIEF AGRONOMIST PULLMAN PROJECT

Extensive areas of dismal sage and drifting sand on the range lands of the Pacific Northwest are a sharp contrast to the vast seas of luxuriant bunchgrass which greeted the early pioneers on their arrival in this great intermountain grazing region. This valued heritage of millions of acres of excellent range land has been destroyed by those who need it most. Some of it yielded to the plow; the remainder succumbed to the effects of overgrazing.

Pioneer cattlemen concur in the fact that when they emigrated to the unbroken ranges, the bunchgrass seldom failed to reach the saddle stirrup. Today, in its stead, mile after mile of sage, sand, and rock present a gloomy picture of practically valueless eroding land. Erosion by water has removed a large part of the surface soil. Gullies, dry stream beds, and empty water holes are common. Wind erosion has scattered the soil from millions of acres since the grass cover was destroyed.

Few vestiges of the climax bunchgrass association of the western states remain. Sagebrush has crept over the land once carpeted with the "Palouse Prairie". The exact extent of this prairie has not been definitely determined. However, by a study of relicts, it is possible to picture it as originally extensive. With this picture comes one of complete control of erosion processes. Would that the lessons these relicts teach could be impressed on all who are concerned with the land!

In the heart of the reliable wheat belt of eastern Washington is

a 1600 acre remnant of climax bunchgrass prairie. Around it on three sides stretches the wheat land of the Palouse, scarred and marred by wind and water erosion. It alone remains intact and in complete command of the soil in which it is rooted and which it helped to form. To the westward and beyond the Palouse lie millions of acres of range land on which little valuable cover remains. It forms the link between the land of the pioneer, the land of today, and the land of tomorrow.

An orthodox "cow-man" owned this remnant of Palouse prairie. When those around him plowed and tilled, Charles Johnson kept his grassland intact. He nurtured and protected it with the skill of a frugal pioneer. His repeated admonition to his wheat-farming neighbors was, "You may handle more money when you are farming but you make a greater net profit from bunchgrass." His grassland was never overgrazed. For over forty years it furnished seven months' pasture for 250 to 300 cattle yearly. His steers were never "finished off" with grain, but always "topped" the market as prime two- or three-year-olds direct from the range.

So well has the original grass stand been maintained that Dr. F. E. Clements characterized it as the best example of the climax Palouse prairie in the West today.

Figure 1 shows a portion of the Johnson Estate range as it is today. The density and luxuriousness of the grass and the absence of ruderal vegetation and sage are striking. The picture shows the absence of accelerated erosion. For contrast Figure 2 is shown. This was once a dense stand of bunchgrass; now only sage and the erosional

Fig. 1. Portion of the Johnson pasture. The tips of the trees in an original timber claim plantation can barely be seen in the valley.

debris of a dry stream bed remain. Figure 4 shows an immense gully in range land, the result of unchecked erosion. There is no reason why this land could not support a grass stand like that shown in Figure 1 had it been treated in the same constructive manner.

Grass can be maintained on the ranges in the West. Grass will return a profit when grazing is carefully regulated. Overgrazing has allowed the land to be ruined by erosion and has destroyed the cover on which its value rested. To the West this is a hazard of first magnitude. With the depletion of the cover have come "drought years". One of the old-time herders in Oregon put it this way, "We have had 'dry years' before but none have had effects like this last one."

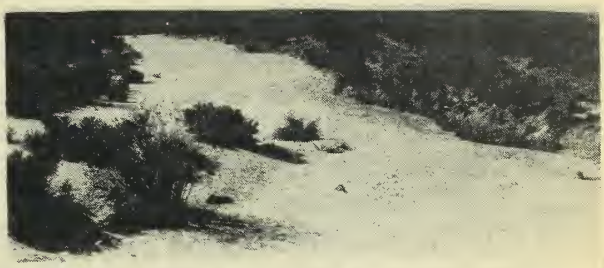

Fig. 2. Dismal sage, dry streams, and eroded soil have supplanted valuable bunchgrass stands on millions of acres.

The Johnson Estate grassland is free from erosion scars except near the water holes. Its topography still bears the unaltered mold of geological erosion. There is no accelerated runoff. On every side is land tilled for fifty years to raise wheat -- acre after acre

Fig. 3. Contrast this slope of summer-fallowed wheat land with the Johnson pasture in Fig. 1. This is the result of a single rain.

of none but wheatland. Wheat stubble and summer-fallow are all that occupy the land. No grass on these farms -- one is told it doesn't "pay". Sharp ridges, gullies, soil slips, subsoil outcrops, and muddy inundations disfigure a once graceful topography.

The summer-fallowed fields of the wheatlands in the Northwest lie unprotected against water and wind, a prey to erosion during each critical period. Steep slopes are farmed without deference to the inevitable toll run-off and soil losses are taking. (See Figure 3). There is no forage. There are no livestock on most of these farms.

The ranges of the Northwest are depleted of their cover. Grazing is becoming less profitable. The productivity of the wheatlands in the Northwest is decreasing. Erosion is taking its toll on both. It is still possible to save most of the grazing land and the wheat land by instituting and maintaining stringent erosion control methods. Action cannot be delayed. The day of rational land use must come, and soon. Without it, grazing and wheat farming cannot remain as profitable industries.

If the overstocked ranges could be relieved by introducing permanent forage on marginal acres on every wheat farm, the solution would be well-nigh automatic. These acres could be grazed just prior to shading-up in the spring and to finish stock when it comes off the range in the fall. Such a plan could be made to "pay". The Johnson Estate grassland is a symbol of what might and must be if the land of the pioneer remains as the land of tomorrow.

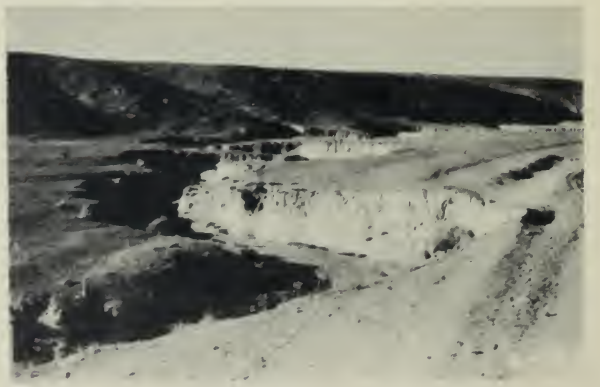

Fig. 4. Denuded range lands soon lose their surface soil and are destroyed by gullies. Excessive runoff explained part of the scourge of drouth years.

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Fundamental Concepts of Erosion

By W. C. Lowdermilk
VICE DIRECTOR

Erosion as a geologic process is as old as the first rain storm; it is older than sedimentary rocks. It is therefore necessary for clarity of thinking, in considering problems of soil-erosion and its control, to differentiate between geologic normal erosion and accelerated or man-induced erosion.

Normal erosion, which I term "geologic norms of erosion" has, throughout geological time, carved out with master hand the wonders of the Grand Canyon of the Colorado and Bryce and Zion Canyons with the leisure of moving glaciers. It has worn through uplifted plains; it has provided material to fill rich alluvial valleys, it has rounded off hills and sculptured landscapes. The benefits have been many because this geologic erosion did not proceed faster than nature formed new soils and a protective cover of vegetation. Thus we may use this geologic norm of erosion responsive to local conditions as a basis for the measurement of what we may call accelerated erosion or soil-erosion. Experimental studies have served to measure the degree of acceleration for varied soils, climates, and natural vegetative cover.

The alarming problem confronting thinking people today is that the agricultural occupation of our land has broken the balance of nature and has produced what I term "accelerated or induced erosion", which means that the soils are washing away faster than new soils are being formed.

What is this balance of nature and what has man done to destroy it? When the first settlers came to this continent about three hundred years ago, they found the largest and richest tract of land in a state of pristine fecundity ever discovered by any people. The vast resources of oil and forests and rich fertile lands were millions of years in the making. It was not a gift for the exploitation solely by that generation or our generation, but it is a heritage to be used, not misused; to be conserved, not exploited, for it must be the basis for the sustenance of our American civilization for this generation, for 1,000 years, for 10,000 years,- but why limit our occupation of

this land. What has happened? We have been here a short time, in the life of a civilization, yet in these few years, we have all combined in one continuous frenzy of exploitation, each generation grasping for all that it could get of the rich contributions of nature, with apparently little realization that we are in danger of making this wonderful land of promise a future land of poverty and impoverishment for the increasing populations of the years to come, whereas we might use those resources wisely and leave them in continued productivity for this and future generations.

The important feature of normal geologic erosion, is that it generally proceeds no faster than soil formation. In other words, nature was able to build up soils and a protective vegetation cover at an equal rate with the normal rate of erosion. Development of soil and vegetation has progressed dependently through time, measured in geologic terms. Vegetation has built up and protected the nourishing soils of varying depths, which were the products of intricate processes of soil formation during thousands of years. Thus this coverage of vegetation and its layer of ground litter under pristine conditions, rendered surface-wash of soil negligible. It also supplied nutrients for myriads of soil micro-flora and fauna, and for burrowing animals. All this favored the percolation and retention of rain water and moisture rendering maximum control of flood flows and at the same time protected the surface from the erosive action of wind and flowing water. Thus the soils were maintained despite the geologic process of erosion. General soil profile development or differentiation into topsoils and subsoils is the evidence of this fundamental fact.

The same processes which have laid waste and barren much of the lands of Asia Minor and China where civilizations have long inhabited the earth, are rapidly destroying our lands in the United States. We can often trace the rise and fall of civilizations by the way they have used and misused their soils. The same processes of the destruction of soils which have brought impoverishment and low economic standards to China, will also bring them to us unless we awaken to the menace of this octopus of erosion, which is reaching its myriad tentacles into fields of our best lands and tearing away the rich, productive soils, carrying them out to the ocean or depositing them to silt up stream beds and our expensive reservoirs and irrigation systems, leaving our lands sterile from cancerous gully systems, or reduced in productivity despite all efforts made in improved crop strains, and application of fertilizers.

Of course man must till the good earth for the production of food and textiles and cut the trees of the forests for homes and comforts.

Such necessary use of soils and forests can be done in a manner which will keep them in a continuous condition of productivity, or, man can in a short period so destroy the soils of the mountains and valleys that they are of little use for any kind of production.

We came to this continent as exploiters. There was an abundance of land. We cleared off nature's protective cover. We exposed the rich soils to wind and rains. We destructively cut off or burned off our watersheds without thought of maintaining continuous productivity We overgrazed our hill lands until there was insufficient vegetation to hold back the soils. On mountain and hill, we broke up the balance of nature for the control of erosion. Farmers tilled the slopes and plowed their fields so that each furrow might become a potential gully. The rich topsoils washed off and left subsoils exposed. Little rivulets rapidly grew into gullies. Gullies have devoured the farms over great areas. Soils were deprived of their natural mantles of protection, and few or no measures to safeguard them from accelerated erosion were taken. Thus the geologic norm of erosion was accelerated at a menacing and dangerous rate for national stability.

This process of land destruction, or suicidal agriculture has gone on without much attention, because there were always new lands to the west to clear and cultivate. Our frontier of new lands was pushed westward until it dissolved in the waters of the Pacific Ocean and has reappeared under foot. Our new frontier is the conservation of the lands which we now occupy. The President's executive order of November 26, 1934, withdrawing the remainder of the Public Domain from homestead entry, brought to a close an era in American history, an era of land exploitation. Essentially all of our good tillable lands are now occupied, their sustained and safe usage become our frontiers of a new era of conservation in land use.

The lands of the earth are now occupied; there are no new continents to be discovered and colonized. We as a people must consider the making of this continent the home of this civilization. Our methods of use of the soil will determine the well-being of the present and future standards of living in this land. We may condemn future generations to poverty and low economic standards, or we may assure the present and future generations of sustained soil productivity.

In the final analysis all things are purchased with food. No civilization can endure when the productivity of the land is wasted away. Farming subsoils when productivity has been washed away will produce sub-citizens, whereas productive lands mean continued prosperity and high standards of living.

It is becoming evident to the thoughtful people of the nation that this prodigal wastage of our soils cannot continue if we are to sustain

the American standard of civilization. The time has come to determine what is the safe usage of land for crops, grazing and forests. We must check erosion by artificial means when necessary and remove from cultivation slopes better fitted for controlled grazing or forests and allow nature to come to our aid with a vegetative cover and protection and save what lands we now have as a heritage for our people.

The country is tardily becoming conscious of the menace of soil erosion. On all side we are urged to extend measured of erosion control which are now being employed on the demonstration projects of the Soil Erosion Service. The growth of interest is marvelous. It is the clarion of hope to tens of thousands of hopeless and distressed farmers. Erosion control will need to be a vital part of long time planning of land use, if our nation is to escape the poverty and low economic standards which have befallen older nations through wastage of soils from the destructive acceleration of erosion above the normal geologic rates of erosion.

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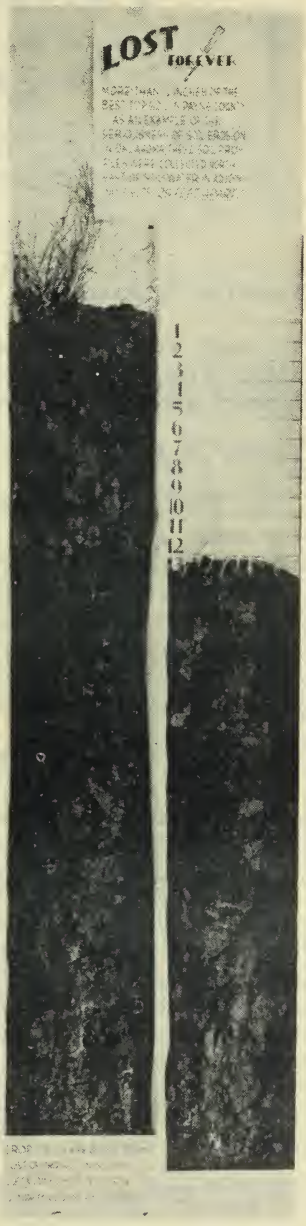
Where does soil washed from farms go? Here is one answer. In this reservoir near Columbus, Ohio, 30 inches of silt -- normally under 20 feet of water, have been collected in ten years.

Soil Profiles Show Alarming Loss in Topsoil

The devastation and havoc caused by sheet erosion is illustrated in the accompanying picture of two profiles of the Kirkland soils, extensively developed in Oklahoma. These profiles were prepared by Chas. A. Hollopeter, Soils Specialist of the Stillwater Creek watershed project.



These profiles show the comparative loss of soil on identical slopes, the first showing the Kirkland silt loam uneroded, as it was before man broke the luxuriant bluestem sod. In the second profile, taken in a field just 25 feet away, more than 12 inches of soil has been removed through sheet erosion, exposing the heavy clay subsoils. The texture has been changed from a silt loam, highly productive, to an unproductive clay which will support only a meager growth of wire grass.

This sheet eroded field has been abandoned, as have thousands of others in Oklahoma. First the individual field, then the whole farm, becomes submarginal.

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THE DISINTERESTED OBSERVER

The Press and the Public
speak their minds about the S.E.S.

President Franklin D. Roosevelt, in opening message to Congress:

"This work will cover a wide field including.....an intensified program to prevent soil erosion and to reclaim blighted areas..." (Jan. 4).

Editorial in the ATLANTA JOURNAL:

"...the greatest land-saving and land-building activity ever known in Georgia...The good results of the Sandy Creek project are not confined to that district. The demonstrations are drawing visitors from other parts of the state and are enlisting the keen interest of bankers, merchants and other men of affairs as well as of farmers and owners of land. For it is evident that if the washing away of soil is checked and controlled, as undoubtedly it can be, the commonwealth will be saved tremendous losses.

"A leaven is at work which means the saving and the making of millions, eventually billions of dollars for Georgia." (Dec. 30).

Editorial in NEW ORLEANS TIMES-PICAYUNE:

"Mr. Bennett makes the point that long has been realized in the lower Mississippi Valley, and which this section has fought hard to impress upon the rest of the nation: that until scientific means are adopted to halt erosion and runoff of rainwater from the surface of the soil... efforts to curb such waters by building levees, new channels or more reservoirs are simply leading in an endless and costly circle"... (Dec. 16).

Editorial in ELIZABETH, N. J. JOURNAL:

"It cannot be stressed too strongly that erosion is a most vital issue..." (Dec.)

Editorial in LOS ANGELES TIMES:

"If the 1934 drouth has succeeded in waking up the country to the danger of soil erosion and the necessity of locking the barn door before all the horses are gone, it may eventually prove to have been a blessing in disguise, despite the appalling losses it has caused...The problem is one that must be faced and solved. The alternative is a continent that will resemble the Sahara Desert."

Editorial in the WASHINGTON DAILY NEWS:

"The American record of land misuse is almost unparalleled', Secretary Wallace reports. 'Perhaps only the Chinese can match it. But they have been on the job longer than we have.'

"We can still save America from China's fate."

Editorial in WALLA WALLA, Washington, BULLETIN:

"The study of erosion to be started in the vicinity of Adams in Umatilla County will naturally be of interest in and around Walla Walla. Further losses can be largely prevented and it is to determine the best ways of doing this that the work will be undertaken in our neighboring county."

Excerpt from Report of Special Committee on Land Policy, Chamber of Commerce of the United States:

"Recently a vigorous program of soil conservation... was inaugurated...headed up in the newly established Soil Erosion Service in the Department of the Interior. The program calls for control of erosion, reduction of the flood hazard, protection of rich bottom lands from worthless sand and gravel washed out of the hills, prevention of silting of stream channels and reservoirs, and readjustment of land-use practices...Every practicable method of control is being used, according to the character of the land. Reforestation and reseeding to grass of the steeper slopes, soil-conserving cropping systems, strip and contour farming, terracing and other erosion control engineering works, and control of grazing constitute the more common of these methods...

"Such activities as these are deserving of public support, not only through appropriations for their continuance, but particularly through local cooperation by farmers and others...

"The Committee recommends further cooperation between Federal and state governments and private owners in soil erosion work; also that this work be continued and developed along sound economic lines."

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Gully Control Work Withstands Torrential Downpours

By Harold G. Anthony

EXTENSION AGENT MINDEN PROJECT

A terrific rain and hail storm visited the Minden area Tuesday afternoon, November 20, 1934. The rainfall totaled six inches in some parts of the area and in no section was it less than three inches. An inspection of the entire area the day following the downpour showed that only negligible damage had been done to terraces, except where fills had not been made and outlets opened. The gully control structures stood the test.

The accompanying photographs show how the dams in gullies held the water and kept it from rushing off too rapidly and washing. The particular gully in the pictures shown here is located on the Holley & Brewer farm south of Minden. It is one of the longest and widest gullies in the North Louisiana area, records show. The dams were constructed several months ago, but had not before been put to a test since there had been practically no rain in this area. The large dams at the head of the gully are constructed of poles, chinked with straw and back-filled with dirt. Aprons were constructed of small pine poles, held in place with wire. The smaller dams, in the lower end of the gully, are constructed of wire with brush aprons and a back-fill of straw. After the water had subsided in the gully it was found that several inches of silt had been collected, not only directly behind the dams, but also over the bed of the gully.

Legumes Hold Soil in the Cornbelt

By F. A. Fisher

REGIONAL DIRECTOR ILLINOIS PROJECT

Corn has been King in Illinois since the state was settled, but legumes are commanding a large share of the honors under the program of the Soil Erosion Service in the Illinois area. Where there was very little clover or alfalfa two years ago, about 25 percent of the cultivated acreage now is being sown to these crops each year.

Our field men have helped farmers establish improved crop rotations on 62,000 acres in the area. In most cases sweet clover or red clover is included in the rotation. In addition, cooperators have agreed to sow 15,000 acres to legumes every year for the next four years.

Alfalfa is one of the most valuable crops that can be grown in Illinois. Its value is three-fold. The first factor of its value is its resistance to erosion on sloping land. Its dense cover and extensive root system reduce soil washing to a minimum. Secondly, alfalfa is one of the best crops for enriching the soil because of the nitrogen and organic matter it adds. In the third place it is rated as the highest profit crop in this state even though corn holds the spotlight.

We had some difficulty in getting started with alfalfa. All of last spring's seedings in this area failed almost completely. The main reasons for this failure were lack of rainfall and the inability to pack the seedbed under the conditions of extremely dry weather. The seed was sown with a heavy drill which ran too deep in the loose soil. If the seed ever germinated, the sprouted plants dried out and perished before they reached the surface.

The fall seeding, on the other hand, was a 100 percent success. This success was attributed to method of seedbed preparation mainly, and suitable climatic conditions. The ground was disked several times instead of being plowed. Plowing would have turned under the limestone which was applied in the spring and would have made it of little benefit to the present crop. In some instances it was necessary to disk the ground six or seven times to kill all the heavy growth of weeds but it was worth all the effort in the final results. Following the disking the ground was packed with a heavy corrugated roller.

The seed was sown broadcast and covered lightly with a harrow run across the roller ridges. This placed the seed at the proper depth in a well-packed seedbed. A wonderful stand of alfalfa was obtained on the entire 3000 acres sown this fall. The chief reason that it has been nearly forgotten in the past is that it would not grow on most of Illinois' soils without liming and farmers hesitated to go to that expense. Knowing the value of alfalfa in saving the soil, its properties of enriching the soil and its value as a cash crop, many farmers now feel that they cannot afford to be without it.

Results obtained at various erosion experiment stations over the country reveal that alfalfa closely rivals bluegrass as a soil-saver. This fact in itself is sufficient recommendation for alfalfa on sloping lands, not only in the cornbelt but in other sections of the country as well. It grows abundantly on sweet soil in Illinois.

Lespedeza is another legume which proved worthy of a great deal of consideration in this area last summer. Despite the drought, it produced a good stand and lived through the summer remarkably well. Lespedeza will grow on sour soil but does better on soil sweetened with limestone. It serves best as a pasture crop and is excellent in controlling sheet erosion.

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EXCLOSURES VALUABLE IN GREAT PLAINS STUDY

By C. J. Whitfield

During the summer and fall of 1934 an erosion-vegetative reconnaissance of the Great Plains was conducted over a distance of approximately 2a,000 miles in the ten states comprising this territory.

One interesting result noted was the presence of sufficient relics in graveyards, fenced areas and other protected spots to lend further support to the theory that the present sod grass type of vegetation, composed chiefly of grama grass, *Bouteloua gracilis*, and buffalo grass, *Bulbilis dactyloides*, is a subclimax type, the area originally being covered by a combination of sod grasses and bunch grasses. The latter were composed chiefly of western wheat-grass, *Agropyron smithii*, and western needle-grass, *Stipa comata*.

Change from the climax mixed prairie vegetative type to the subclimax "short grass plain community" is a result of disturbance (overgrazing, trampling, etc.) and drought.

Exclosures in various types have further proven the soundness of this view and are of value in connection with grazing districts, reconversion of dry-land farms, shelter-belts, and the like.

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Erosion Control in the Navajo Reservation

By Hugh G. Calkins

REGIONAL DIRECTOR NAVAJO PROJECT

The history of the Navajo Indians and their evolution during the past few centuries, from a warlike and marauding tribe to a more or less nomadic nation of peaceful herdsmen and farmers, is yet to be written. It is known, though, that when, after a few unpleasant years of exile as prisoners of war at Fort Sumner, they were returned to their own lands in 1868, they had been reduced to a population of something like 8,000, and that a forgiving Government had started each family in the sheep-raising industry with a small nucleus of a herd. From that rebirth, the population has grown to between 45,000 and 50,000 and their herds have increased to a total of over a million head of sheep and goats, not to mention numbers of cattle and horses.

As human and stock population grew and as blanket-weaving and wool marketing assumed the proportions of a sizeable industry, encouraged by white advisors with abounding faith in the unfailing productivity of the land, grass grew shorter and sparser, especially around the too infrequent water-holes and springs, and gullies began to form. Once started, the erosion process continued at a rapid rate. The Oraibi wash, for example, which once was a mild intermittent stream course confined to a narrow channel between shallow, innocent-looking banks, lined with small but productive cornfields, has become a sinister, twisting gully for its entire length of eighty miles, varying from 20 to 80 feet deep in rich alluvial soil that caves off by the hundreds of tons with every summer freshet. All of its tributaries are in like condition, contributing to the destruction of small farms and helping to carry enormous quantities of silt into the Colorado river where it is a pure detriment.

Just as it has been shown that the painted deserts and many of the picturesque features of the Navajo country are the products of natural processes extending through geologic eras, it has been amply proven that accelerated and destructive erosion of the Oraibi Wash variety is directly attributable to that almost universal enemy of the Southwestern States -- overgrazing. Too many grazing animals, either concentrated in a small space or spread over a large area, reduce the normal stand of grass, weeds, and shrubs and allow the unrestricted flow of rainwater over the hillsides. Broad grassy swales become networks of tiny gullies eating out cancer-like in every direction and combining, in their downward paths, to form giant straight-banked ravines, sapping

Exposed roots of Yellow Pine on rock slope. Presence of roots shows that once this slope had soil on it. Mexican Springs area.

the water formerly available for plant growth and destroying the power of even the richest soil to produce worthwhile vegetation growth.

The Navajo country, comprising some 25,000 square miles -- as big as the state of Pennsylvania -- and stretching from the Grand Canyon of Arizona far into New Mexico, is too often and too carelessly described as a desert. True, its lower fringes, in regions of extremely sparse rainfall, is naturally endowed with desert-like features, but in the main it is only a desert to the extent that men -- white men with an often sincere but mistaken desire to help the Indians -- have made it so.

Picture this country as the Spaniards, who brought in the first domestic four-footed animals, found it; ranges of wooded mountains and hills alternating with broad valleys filled to great depths with rich, humus-bearing soils, covered with an abundance of palatable grasses, herbs, and valuable browse plants. Wild hay was there for the cutting and the succulent chemise or shad-scale, that choicest of sheep and cattle feeds, abounded in the moister bottom lands. The hills were clothed with a less luxuriant stand of grass but with a greater variety of valuable shrubs with great forests of pinon, juniper, and pine in all stages of growth. Streams, whether their flow

was on the surface or underground, were lined with willows, cottonwoods, and other trees, of direct use to man and of indirect use in controlling runoff. The inhabitants of the region were pleasure-loving, relatively prosperous people whose economic life was bound up with the simple problems of bartering the simple products of their handiwork and hunting prowess.

Contrast that picture with the situation that prevails today. Once-productive valleys are cut to pieces by ugly gullies; corn fields and squash-patches formerly irrigated by the simple methods of floodwater farming are rendered valueless because the water-courses, large and small, have become wild and uncontrollable; slopes and valleys that produced abundant forage are given over to worthless weeds or bare ground because, deprived of the vegetative mat that once held back the water and filtered it into the soil, they now act as roofs over which the water flows in sheets to the gullies. Because of overstocking and an undue proportion of goats, the browse cover has been nearly destroyed. The pinon, that valuable nut-bearer whose great crops have been one of the Navajos income-producers, is gradually disappearing because the goats destroy the seedlings and the mature trees are being consumed for fuel. The recurrent drouths which once held no terror for the Navajo now deprive him of income and hasten the depletion of the land.

Where antelope, deer, and wild turkey were once abundant, overhunting and overgrazing have made them non-existent.

Examples of erosion caused by water after vegetation has been destroyed.

Such was the situation recognized by forward-looking officials of the Indian Service and brought to a focus last year by John Collier, Commissioner of Indian Affairs, who sought the advice and help of H. H. Bennett, Director of the newly-created Soil Erosion Service. As a part of the great program, the Soil Erosion Service established the Navajo Project on January 1, 1934.

The problem was not a simple one of gully-plugging. Its solution demanded a combined effort of governmental agencies toward the economic and social rehabilitation of a great Indian nation, involving the right kind of education, the upbuilding of arts and crafts, and the

re-establishment of agriculture and grazing on an enduring basis. The Navajo people must be convinced that the situation was serious and that they must make a sacrifice to save their lands. The government must immediately start the process of restoration and furnish work to produce wages as an offset to the loss in income from livestock.

Indians at work on a head erosion control structure.

The task of the Soil Erosion Service was, among other things, to determine the carrying capacity of the Reservation for livestock, the best methods of range management, and the possibilities of restoring eroded and depleted land to a productive state for farming and grazing. In short, a complete and workable plan for land restoration and land management must be formulated and put into effect. In order to carry out this program the Soil Erosion Service has employed a technical staff, established a land-use experiment station at Mexican Springs, on the Reservation, started comprehensive range and soil surveys, and selected a series of demonstration areas, ranging from 5,000 to 10,000 acres, on which the actual work of erosion control has been started. These areas cover the Reservation from Kayenta to Klag-e-toh, from the Cove to Mariano Lake, and more of them will be added so that all representative types of range and erosion will be included and the entire population will have access to examples of what can be done toward restoring their lands. Each area is fenced and all stock excluded, to be partially brought back when proper numbers and methods of management can be worked out.

Removal of topsoil by the action of wind and water has exposed the roots of the juniper in Red Rock Valley.

The whole-hearted response of the people to the request that they

give up their grazing grounds, and the keen interest shown by them in the work, has infected the Soil Erosion staff with corresponding enthusiasm and energy. Sice the work of restoration must be carried to a conclusion by the Navajos themselves, the partnership now being formed between the people and the agencies of government is a hopeful sign that the project will ultimately accomplish its objectives.

First and most important step in the program is the reduction of livestock to the carrying capacity over a period of three or four years. To this, spurred by efforts of the Indian Service and the Navajo Tribal Council, the Indians have agreed. Already they have made an initial cut in sheep and have removed half of the goat population.

Once the herds have been reduced, the control work can -- funds permitting -- proceed rapidly. Aside from restoring natural vegetation through range management it is and will be the aim of the Soil Erosion men to revegetate the ranges by such artificial aids as will detain the greatest practicable amount of water where it falls. For this purpose they are diverting water out of gullies, around gullyheads, and spreading it over flat and gently-sloping ground to augment the natural growth of grass and other plants. Gullies that are too big for such treatment are planted to quick-growing cottonwoods, willows and tamarisks and, as rapidly as stock can be produced, with food-bearing trees such as wild plum, walnut, and honey-locust. Denuded spots are being planted or sown to a great variety of native plants that can be easily propagated, and are valuable for forage as well as for holding the soil. Water diverted from gullies is being made available to the Indians to the greatest possible extent for flood irrigation. Where necessary, check-dams, wire and brush dams, and jetties are being built.

Three fundamentals are stressed: first, all efforts must be directed toward aiding vegetation, the only cure for erosion; second, artificial structures must be simple ones; and third, that all white men must know the Navajo and his wants, teach him the basic facts of land management, and inspire him to help himself along the right road.

The Navajo is endowed with a high degree of native intelligence and integrity. Show him the logic of a situation and he will go all the way with you. He has never surrendered his independence but he was -- economically at least -- on the verge of doing so. Working in cooperation with the Indian Service and tribal representatives, the S.E.S. is attempting to do its part to make the Navajo nation a self-sustaining, self-respecting, and truly free people. It is too early to predict that this great experiment in human rehabilitation and land-restoration will succeed. Nevertheless, the equally favorable response, to date, of both people and soil is most encouraging.

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By Ewing Jones

TECHNICAL SECRETARY

A scant ten years ago, this nation was just beginning to suffer an epidemic of nascent radio stations. Commercial programs, with the exception of a few local "plugs" and sporadic Whoosit Mercantile Company broadcasts, were unknown. Radio "bugs" hunched before three-tube sets at radio parties -- instead of bridge or cocktail parties -- and alternated using cumbersome headsets. Static crackled in staccato blasts and whistles blighted the dubious entertainment.

Of course, the radio was thrilling, but for entertainment the victrola was the accepted thing. It was great sport to wire the broadcasting station that "program is coming in fine", and listen with abated breath for your name to be read over the radio. And it usually was.

At this same time, the future of soil erosion control was not particularly heartening. Once in a blue moon a short article or technical bulletin would appear on the subject. A few men had already seen the light and were becoming energetic in the study of this problem. A chunky fellow named H. H. Bennett was Inspector in the Soil Survey under the Bureau of Chemistry and Soils.

The future of radio in education was uncertain in 1925. In 1935 its authority is not questioned. Thus education of the masses in the important matter of erosion control via the airwaves is not only timely but advisable, and practically every project of the Soil Erosion Service has been alert to take advantage of its possibilities.

It is but natural that H. H. Bennett, as Director of the country's most comprehensive attack upon soil erosion, should assume the lead in this matter. His appearances on the air have not been volunteered --

since 1932, he has been drafted no less than a dozen times by the coast-to-coast Farm and Home Hour. Director Bennett has likewise gone on the air locally in connection with the delivery of technical papers at scientific meetings.

The Athens, Georgia project has been allotted one 15-minute program each week over WTFI. Although the station is a small one, it is estimated that 300,000 people reside within its coverage. The last census showed 200 radios in the Sandy Creek demonstrational area. It is interesting to note in this connection, too, that radio dealers in Athens sold 1,000 battery-operated sets during November, 1934, 90% of which went to rural residents. A two-fold objective,- to make the programs both interesting and instructive,- is kept in mind by Regional Director Loy E. Rast.

Out in the Palouse wheat belt, the Pullman, Washington project has been filling the air for a good many months. Series of talks was given over the Western Farm and Home hour hook-up, followed by releases through Idaho Farm Flashes over KFPK, Spokane, and a series of two papers given over a Northwest hook-up of eight stations. Good will programs were then started, with lots of variety and fun as well as instruction. The latest stunt has been to organize an orchestra of SES members under the name "Bunchgrassers", this title typifying the original vegetative cover of the region.

A. F. Ruff, Assistant Regional Director at Rock Hill, S. C., has just completed arrangements for weekly broadcasts over WBT, Charlotte, N. C., a 50,000 watt station. He was offered unlimited time on the air at mid-day in addition to his scheduled 15-minute talks at night. With Dr. T. S. Buie, the Spartanburg Regional Director, Mr. Ruff intends to present an ingenious "Soil Erosion Game", devised by the former, over the air. Details of this game are being withheld temporarily. Dr. Buie has held quite an extensive schedule, with several programs over WSPA and WBT, from which he received excellent comment, and is now running a series of 15 talks over WFBC. Most of these talks have been strictly informational, but Dr. Buie plans to develop the dialogue type of broadcast.

The California project under Harry E. Reddick has not made extensive use of the radio until recently, having confined its air extension work to intermittent news and announcements through the Farm and Home hour. Starting this month, however, regular monthly use of radio service is planned. The coverage for California is excellent with the Farm and Home Hour, which has from seven to ten stations.

Radio broadcasts by the Nebraska area have been arranged over two stations. WJAG features a weekly appearance of some member of the Soil Erosion Service staff of Regional Director R. L. von Trebra. The aud-

ience of this station, estimated conservatively at from 40,000 to 50,000, is largely rural. On alternate weeks programs are given over WGBZ, a 500 watt station with a wide coverage. These broadcasts emphasize activities of the Service. Importance of erosion from a national standpoint, physical, economic, and social, is likewise stressed.

Members of the Mankato, Kansas project have been fortunate in securing the active cooperation of the extension department of Kansas State College. Under the guidance of Regional Director F. L. Duley, the S.E.S. staff prepares articles on various phases of soil erosion work. These are broadcast not only over KSAC each week, but over eight other cooperating radio stations to which the material is sent. These talks are occasionally broadcast by staff members themselves, but generally the material is read by some other member of the radio force. The same material is then rewritten for newspapers.

Project No. 15, Minden, Louisiana, considers itself fortunate in being granted time for a weekly broadcast over KTBS of Shreveport. The station is owned by the Shreveport Times, which incidently has almost daily carried news stories of the North Louisiana project, and is sold on the erosion control objectives. The station is an NBC outlet and a popular one among listeners in the Arkansas-Louisiana-East Texas-territory.

The Louisiana broadcasts, which follow immediately after the National Farm and Home hour, have thus far been given by Harold G. Anthony, Extension Agent. The first two were of a general nature on the work and its need. Subsequent talks are more specific, with a few minutes' time at the end of each broadcast being allotted to answer questions which come in following each appearance on the air.

Radiocasting is a new departure for the Chatham, Virginia area but, like other projects, its reaction is favorable. Weekly talks are given over WBTM at Danville during the Farm Bulletin Hour.

Regional Director L. P. Merrill, Lindale, Texas, has been running occasional talks, and is now engaged in a series of 16, with the assistance of his extension agent, P. H. Walser. At Zanesville, Ohio, Director J. C. Cutler has frequently taken the air, the Ohio State University station WOSU at Columbus being one of the outlets.

The Cornell University station at Ithaca, N. Y., WESG, has been invaluable to Dr. F. B. Howe, the regional director there. Dr. Howe recently sponsored a series of talks in which most of his staff and advisory council took a hand.

Success has greeted the radio educational work of the Soil Erosion Service. Responses have been overwhelming. Hordes of requests for more information are coming in. The work has sold itself.

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Role of Forest Litter Shown by Studies

By E. V. Jotter
CHIEF FORESTER

Destruction of the forest with loss of valuable stands of timber is a cost of forest fires which is readily apparent. A less dramatic and less immediate cost than the burning of mature trees, but one which is of even more serious economic consequence, is the greatly increased danger of soil erosion which is the inevitable aftermath of forest fire.

The function of trees as soil-builders has generally been recognized. The importance of forest cover in preserving the stability of the soil, and in absorbing and conserving rainfall has been conclusively established by experiment and research. On a slope stripped of its vegetative protection the runoff of water is unimpeded, and the soil is exposed to the destructive force of erosion.

In California, for example, and in other regions where water is paramount in determining land use, this capacity of the forest cover to conserve rainfall is of especial importance. For much of our understanding of this function of the forest we are indebted to the researches of Dr. W. C. Lowdermilk.

The start of a forest fire in Southern California.

The so-called "sponge effect", the capacity of forest litter to absorb water, was known and generally recognized, when Dr. Lowdermilk's researches in China first made known the further function of the litter in keeping water clear, and in preventing the sealing of the earth's surface. Results of other of his studies, conducted in California, show that the amount of water running off of forest plots that had been burned over is much greater than for similar unburned plots. During one major rain storm, the runoff was 35 times greater from the burned area than from the unburned.

In the eastern hardwoods region where there has been a great lowering of water tables, the research of Dr. John T. Auten of the Central

States Forest Experiment Station is particularly significant, and should be of interest not only to those concerned with soil and forest conservation, but also to the farmers of the region, many of whom have been forced by the decreasing water supply to haul water for stock.

Dr. Auten's studies showed that the failure of springs and streams, the lowering of water tables and the failure of wells are closely related to decreased forest lands and to the poor condition of remaining woods. His experiments indicate that undisturbed woods (those in which there has been neither forest fires nor grazing) take up from three to nine times as much water as those which have been burned.

This devastated forest scene shows direct forest damage but does not show subsequent losses to soil and its capacity to absorb water.

These two examples of research are representative of many other studies which show the importance of the forest cover in preserving the soil and in conserving rainfall.

Another result of a forest fire. Burned over slopes could not hold back the onrush of mud and boulders following a torrential rain.

Making A Reconnaissance Erosion Survey Map

By W. F. Beamon
CHIEF DRAFTSMAN

Realizing the need for a well defined plan of operation if its program was to prove successful, the Soil Erosion Service undertook, shortly after its organization, to obtain data and prepare maps showing present erosion conditions in the United States. The assembling of such information, it was felt, was essential to the proper determination of future policies and careful planning of future work.

On August 18, 1934, it was decided to make a reconnaissance erosion survey of the United States and the drafting division was notified to prepare for the task of translating the results of the survey into maps of the entire country and of each state. As the work was to be completed and copies of the national map ready by October 30, the assignment called for exceptional speed on the part of the Drafting Section.

It was first necessary for the drafting room to obtain all available base maps in the United States for use by the field men in making their field surveys. In the selection of these base maps, first preference was soil maps wherever they were available, for inasmuch as the same soils tend to erode in the same manner and degree under the same conditions, the soil outlines and the erosion areas could be plotted in detail with a high degree of accuracy.

Second preference in the selection of base maps was given to Geological Survey topographic maps and Army topographic maps because the land slope and contour indicated on these maps permitted a better visualization of the most probable and natural divisions of erosion. Third preference was given Post Office maps because of their general accuracy in showing drainage and road locations. When maps of these types were not available, any base map which would serve the purpose at hand was secured.

Placing these maps in the hands of the field survey men, the Drafting Department turned itself immediately to the matter of obtaining necessary equipment and of securing and training a competent personnel to handle the projected work as fast as the base maps were returned from the field.

As the drafting force consisted of only three persons it was necessary to contact and interview approximately 175 draftsmen and to select therefrom a force of 45 whose experience was flexible enough so that they could be quickly trained for the special work to be handled. While the personnel was being obtained and given advance training the

town was being scoured for drafting equipment. Even after every available drawing table that could be bought or borrowed was secured it was still necessary for some of the draftsmen to work on everything except the floor. During this period of preparation various standards for carrying out the actual work had to be set up, and it was also necessary to select and prepare the best available base maps on which the final work was to be presented.

By this time the soils men in the field were sending back their plotted surveys. These were checked in, given a file number, and turned over to Dr. Mark Baldwin, who from his vast experience with the general soils conditions in the United States, could exercise the responsibility of making a thorough inspection and check of these maps before they were turned over to the draftsmen. Where necessary, maps were returned to the field for any corrections or changes to bring them within the accepted standards. After being passed by Dr. Baldwin the maps were turned over to the individual draftsman, who transferred the data which was on various scale maps to the individual state maps on a scale of 1 to 500,000. The plotting of the draftsmen was then thoroughly checked for accuracy and workmanship, as well as against adjoining states and counties so that when maps were laid edge to edge they would be in perfect agreement. Although most of our field work was sent in in very good shape, there were some instances where it was necessary to return maps to the field again so that the field men could reconcile differences which appeared on adjoining maps made by other surveyors.

When the detailed individual state maps were completed the poor old draftsman's worries were just begun. He had then to planimeter and determine the actual area of the various erosion classes both by county and watershed, and to prepare therefrom final tabulations which were made by the draftsmen under the direction and supervision of our statistical division. To insure accuracy in this work each area was planimetered twice, and checked, both by the original planimetering and against the total county area, until they agreed within ½ of 1%, the allowance we made for expansion and contraction of the paper due to weather conditions. The map was then turned over to the copyist to be inked in, lettered and each erosion class colored to conform with a set of predetermined standard symbols to identify the various erosion classes.

From the above state maps it was necessary to make a map of the United States showing the same distribution of erosion as on the state maps, but on a more convenient size. The draftsman was again called upon to reduce the state maps to a United Stated map on a scale of 1 to 5,000,000 showing the various classes of erosion in as much detail

as consistent on a map of this scale. After all data was transferred from the state maps to the United States map, several hand-colored copies were made to be presented with the National Resources Board report, as our time limit was too short in which to have this map published.

After this map had been accepted as satisfactory, preparations were made to have it reproduced in quantities. This reproduction requires: first, the preparation of a base map for the lithographer's use, showing the state outlines and names; second, a base map for the river lines, lakes, etc., and their names; third, base maps showing the outline and number symbols of the various erosion areas; fourth, color charts and legend for the various colors to be shown on the finished map. After the contract had been placed with the lithographer, he made a plate for each base map and each color. As fast as the plates were made a proof was taken from each plate and checked and corrected by the drafting room. After the plate had been corrected by the lithographer, a second proof was made and checked again by the draftsmen. It was also necessary to make checks on each color plate, one for accuracy of detail and a second for accuracy of color and register. Then a final check was made with the composite colors on the map to determine any final discrepancies and to check the color shades before allowing the lithographer to make his final printing of the finished map.

In making up these maps 39 separate color symbols were used. These will act as a basic set for all future erosion maps. This required the lithographer on this particular job to make up 17 plates including the necessary base plates.

This gives an outline of the difficulties encountered in making a map of the United States showing the distribution of erosion. The Drafting Department of the Soil Erosion Service, however, has completed its share of this work, and the map is now in the hands of the lithographer. Moreover, plans are being laid and estimates prepared to have copies of each of the state maps reproduced in color. The drafting department is already at work on the base for these state maps, which will show the degree and classes of soil erosion in much greater detail than does the United States reconnaissance erosion survey map.

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BIBLIOGRAPHY ON SOIL EROSION SERVICE COMPILED

A bibliography on the Soil Erosion Service and its works has recently been compiled by James T. Rubey, Acting Librarian of the U. S. Geological Survey Library. It will be revised frequently.

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Miniatures

Dr. Buie's boys -- see photo -- put their South Tyger River project in their pocket, so to speak, and took it to the fair.

— with a mighty Meaning

South Carolina farmers marveled at a Lilliputian lesson -- and made up their minds to mend their ways.

Coordinated Attack on Enemy Essential to Campaign

By T. S. Buie

REGIONAL DIRECTOR SPARTANBURG PROJECT

Can we conceive of the frantic preparations for attack which would be made had a foreign foe landed troops on our shores and laid waste to a territory approximately twice the size of South Carolina? Actually an enemy -- an enemy as real as any our troops ever have faced in battle -- has conquered an area 35,000,000 acres in extent, laid waste to what once were fertile fields and almost unchallenged continues his relentless march of destruction across other fields wherever the slope of the land is sufficient for water to flow.

The fact that this area of land, the value of which has been effectively destroyed by unchecked erosion, does not lie in one body but is distributed throughout the entire country, prevents the public from realizing fully its significance.

Let us for a moment consider what would be our plan of action were we facing an armed foe instead of an agency of nature, and note the similarity between such a plan of attack and the coordinated program of the Soil Erosion Service to combat this menace to agriculture.

First, we would learn everything possible of the enemy -- his relative strength at various points, thereby determining the most vulnerable positions. In order to acquire such information we would employ air craft of all kinds, supplemented by military intelligence and information from any other source which would be of value. Having such information, it would be possible to plan an attack with hope of ultimate success.

In like manner the program of the Soil Erosion Service involves making plans for treatment of each area in accordance with the best known methods of control. A definite procedure is indicated for each separate condition. After such a plan of action has been agreed upon it is put into execution in much the same manner as a military plan of action is initiated.

In a military attack artillery preparation is essential and it is particularly necessary that such fire be directed where it will be most effective and not dissipated throughout a large area. Just so with the terracing program in an effective plan of erosion control. Terracing is one of the most valuable measures of control, but

just as the fire of artillery should be coordinated with other arms of the military service in an attack, terracing should be coordinated with other measures of erosion control, and employed where it will be most effective.

In modern warfare, tanks -- supplemented by machine guns and auxiliary arms -- play a most important part. While such implements of warfare are very helpful in an attack, they do not permit of final occupation of the position and consolidation of gains. The use of such arms of the military service in warfare may be directly compared to the building of check dams in gullies, the construction of terrace outlets, the preparation of controlled waterways, and the like, in the fight against erosion. While very important in each case, they are but a means to an end.

Finally, as in the military engagement, the ultimate victory is dependent upon the aggressiveness of the infantry consolidating the gains made possible by the coordinated attack by all arms; the effective control of erosion is dependent upon vegetative cover. In the program of the Soil Erosion Service main reliance is placed upon vegetative methods of control -- nature's method of protecting steep slopes.

Contour cultivation, strip cropping, strip rotations, substitution of close-growing crops for clean-culture crops, placing slopes in pasture and reforestation of steep slopes, are considered as most effective methods of control. Terracing, construction of terrace

Gully encroaching upon a South Carolina corn field.

outlets and controlled waterways and gully control work in general are very important phases of the erosion control program, but in the last analysis are but a means to an end in that revegetation of many slopes is the only answer.

In an attack on an armed foe Americans would not be satisfied with one method of approach alone. They would consider the throwing of a few shells into the enemy's camp at intervals ineffective. Some good would be accomplished, it is true, but we would not limit our activities to such nominal preparations for we would realize that we could not hope to stay the progress of the enemy, much less drive him from our shores, by such an ineffective method of attack. Rather we would employ every means at hand -- every device which the ingenuity of our inventors and experimenters could develop. Just so it is in our attack on the greatest foe of present day agriculture -- erosion. It is absolutely necessary that in attempting to combat this menace we attack all along the line using all the implements and methods at our disposal, just as would be done in the case of an attack on the armed force of the enemy. This is the program of the Soil Erosion Service.

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The start of a gully in a South Carolina cotton patch. Unless checked, it can soon reach proportions similar to those shown on the previous page.

BY WAY of BIOGRAPHY

R. E. Uhland

Regional Director, Bethany Project

in charge of Missouri project, it is quite natural that he should have resided there "almost all my life"...which dates from April 10, 1896. schooling at the University of Missouri...an M. A. degree in Soils and Crops in 1924...graduate assistant and research instructor while pursuing work toward a Ph.D...enlisted in the Navy during the war...took up dirt farming, operating a general farm of 240 acres and a 70-acre orchard...accepted position with the Forage Crops office, Bureau of Plant Industry, making general study of the Mississippi Delta...instrumental in starting a number of experiments... which are still in progress...went with Bureau of Chemistry and Soils in 1930, later becoming superintendent of the Soil Erosion Experiment station at Bethany... there until October 10, 1933, whenhe joined the Soil Erosion Service... like most regional directors, is a fluent and technical writer...invented a divisor flume for taking aliquots of runoff...has had a heavy load as director of two joint areas...but that hasn't even slowed him up...short, stocky...bristly, greying hair...ultra-friendly...would stare if you called him "Russell", but that's his name...

Should Erosion Control Be Dramatized ?

By Chas. D. Jarrett
VENTURA PROJECT

Yes, and the reason is this. Soil erosion, of the man-induced type, is the greatest menace this country, or any other country depending on its agriculture for its prosperity, has ever known. We can do little more than guess regarding its influence upon the fall of those nations that prospered and passed only to leave crumbling ruins in the deserts we know today, but there is a growing belief that the sinister and greedy hand of erosion played a far greater part than has heretofore been suspected. Soil erosion must be controlled. Soil erosion can not be controlled without the cooperation and education of the men who actually manipulate the soil for their living. We have our conclusions, experimental data, and our proven corrective methods, but they are like jewels locked in a vault until they are delivered to and used by the men who in the end must decide the value of the Soil Erosion Service. Ours, particularly in the Extension Department, is very much a problem of delivery, and there has been no cart or carriage devised to date that will deliver information to the masses as efficiently and as effectively as drama.

How can we dramatize soil erosion control? We know that soil erosion has already cost this country ten billion dollars, and we tell the people that -- but it doesn't register, because not one in a thousand of our listeners or readers ever saw as much as fifty thousand dollars. We tell them that soil erosion has taken a value out of this country equal to fifty 30-car freight trains loaded with silver dollars, and that draws a picture. A freight car loaded with silver dollars leaving this country on a one way schedule would be dramatic to the man who has to work two hours for a single silver dollar.

We speak of sheet erosion that gradually washes away the topsoil, but it doesn't draw a very exciting picture to the man who has lived all of his life on the land. We speak of sheet erosion -- the sneak thief, who robs farmers while they sleep, and who creeps on to the land in the guise of a friendly rain, and then we draw a picture that immediately stiffens the hair on his neck. No man likes to think that his possessions are being systematically plundered while he sleeps.

We say that improper tillage is destructive to the topsoil, but

while it is unquestionably true, it fails to bang the average farmer hard enough to make him sit up and think. We say, "Good men have robbed their children, and they will immediately bristle, because they are good men and would never knowingly rob anyone. The implication arouses them, or if printed, catches their eye, and they read on while you prove your point.

We say that the problem is to keep the moisture in the soil, and the average farmer will yawn and reply, "Sure, I've known that since I was a boy." We say, "It is purely a problem of making running water walk," and we have not only drawn a picture, but presented a challenge as well.

We tell a group of farmers that a gully is destructive, and they will all agree, because they have known that for years. It's an old and familiar story to them. We tell them, "There's a gully over here on the Jones place that has moved more dirt off of his farm than Jones and his hired man could have removed with a Ford truck, if they had spent fifteen days out of every thirty hauling the farm down to the river and dumping it in." That is true about the gully on Jones' farm, and it's dramatic when we compare the ability of the gully as a dirt mover to that of himself and his hired man.

Drama in presentation is the most effective tool that any speaker, teacher, or salesman can use in reaching the thinking processes of the uninformed. Soil erosion control is a vital problem that concerns every living man, woman, and child, and because it is so important that they know, it is imperative that we employ every ethical means to impress them with the peril of continued indifference. The decay of a nation's agriculture is drama to those whose happiness and prosperity is at stake, and any movement to avert such an end is, and must be, essentially dramatic. Count the number of farmers you know who pay to hear a farm lecture, and then, after watching them at the ticket booth of a movie show, draw your own conclusions.

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A sloping field,
A surface bare,
A heavy rain
And the soil ain't there.

A sloping field,
A clover cover,
The rain soaks in,
Somehow or other.

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Nebraska County Aids In Gully Control

By E. R. Kinnear

CHIEF ENGINEER NEBRASKA PROJECT

One worthwhile phase of erosion control has been worked out on the Albion project which exemplifies a fine degree of interest and cooperation.

Within the area in the two counties of Boone and Nance are many inadequate drainage structures along the county roads. In more than twenty cases, both wooden bridges and culverts are so installed that severe gully erosion continues to destroy adjacent farmland. In many cases the bridges are replaced by larger ones every year or two, and the culverts and road fills are often completely washed out in normally heavy rains, hence, in addition to loss in land values through erosion, the maintenance cost to the county is excessively high.

A specific case is given here. Across one major gully a 35-foot timber bridge had become virtually unsafe, due to the gully eroding to a depth of 30 feet below the bridge deck. This gully has already cut 500 feet through the farm on the south, and was cutting into the farm to the north with a 22-foot head. The bridge would have to be replaced within six months at a cost of about $1,500.00. The Soil Erosion Service has corrected this situation by installing a drop culvert at a cost of $450.00.

The field to the north draining into this gully has been terraced with level terraces, and will be farmed on the contour, the bottom terrace being a bench terrace. This cuts down the drainage area so that an 18-inch Armco pipe culvert has now replaced a 35-foot wooden bridge.

To accomplish this job cooperation of the landowner, the County, and the FERA was obtained. The landowner supplied the culvert pipe and materials; the County supplied the machinery for grading; the FERA supplied relief labor and teams; and the Soil Erosion Service supplied supervision and design.

The result is that the gully erosion has been permanently stopped, the County is relieved from further maintenance cost of renewing the bridge several times, and the relief labor has performed a valuable work. There are seven other projects of this nature now in the process of negotiation with the landowners and the County Commissioners.

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Appraising the Soil Resources on the Salt Creek Watershed

By A. H. Paschall

CHIEF SOIL EXPERT OHIO PROJECT

The primary responsibility of the Soils Division is to prepare maps which will give an adequate evaluation of the present conditions of the area. They are the appraisers who examine the assets and liabilities of the land for the Soil Erosion Service. They map the soil type, cover, slope, and erosion of the area. The soil experts inventory the "Today" of the land within the project area. It is upon their work that the "Tomorrow" of the land is based.

In the Salt Creek watershed the soils present a complex problem. They are residual, being derived from interbedded sandstone, shale, clay shale, and limestone. Consequently the soils are very much mixed and present a wide variety of characteristics. It is not enough to classify the soils and types according to the system of classification of the Bureau of Chemistry and Soils, but they must be grouped according to certain characteristics. Two groups suffice for this project. The first group includes soils derived from sandstone and shale rocks. They are usually of silt loam texture and have acid reaction. The second group of soils are those which have some limestone or calcareous shale in the parent material. They are usually silty clay loam and have alkaline to neutral or nearly neutral reaction. The characteristics of these groups affect the erosibility of the soils either directly or indirectly. It follows that the group of soils with the least erosivity (Group 2) has a wider range of adaptability for land use, especially as regards the steepness of the land that may be used for any given purpose.

The slope classes are those established by the Washington office. These classes are: "A" slopes for cultivated crops; "B" slopes for cultivated crops where some form of erosion control is practiced; "C" slopes can be maintained as permanent pastures without serious erosion; and "D" slopes must be maintained in woodlot to prevent erosion. On the Salt Creek project the limits for the two groups are given in the table below:

	Slope Class			
Soil Group	A	B*	C	D
Sandstone and shale	0 - 5%	5 - 20%	20 - 30%	30% or more
Some limestone material	0 - 5%	5 - 25%	25 - 40%	40% or more

*The "B" class is subdivided into B and BB classes with the limits being 5 - 12% for the B subclass; and 12 - 20% and 12 - 25% for the BB subclass.

The kind and condition of the present crop is essential information in planning cropping systems especially in a region where a crop rotation is followed. Annual crops vary each year, hence it is not so necessary to have a rating of their quality. It is sufficient to know the type of crop, whether it is corn, wheat, or some other annual crop. However, perennial crops as pastures, meadow, and woodlots carry over many years and a quality rating aids materially in planning the immediate treatment and erosion control measures. Each pasture is given a rating which shows whether it is a good, fair or poor blue grass pasture, or whether it is poverty grass, or is weedy and worthless. These ratings can be translated into the measures necessary to control erosion. The meadow classification is worked out to show the type and condition of the crop. It also indicates whether the meadow should be reseeded or will improve with treatment. The woods classification indicates the type and age of the woodlot, also whether or not it is open and pastured. For example, the symbol F3 on a woodlot indicates that it has all sizes of trees from young to mature. It will be possible to harvest a few trees from this woodlot every few years and still maintain a good cover. F4y on a woodlot indicates that the trees are all old and mature, also that there are not enough trees to cover the area. Woods of this type will require considerable underplanting to prevent erosion.

The amount of erosion is indicated on the map after the system established by the Washington office for the various projects. In addition it has been necessary to add a class (Class 6) to indicate slips and landslides.

All work is indicated by symbols on aerial photographs. The amount of detail shown is determined by one question -- is this information valuable and essential in planning the reorganization of the farm to control erosion? If the answer is "yes", the point in question is indicated on the field map; if "no" the point is omitted.

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That erosion control is a tangible farm asset to be included in the list of improvements is fast becoming recognized. Recently a Central Illinois newspaper advertised a farm for sale. Included in the list of improvements noted by the paper was the fact that soil erosion control had been signed for. The clipping was sent in by G. M. Flint, Camp Superintendent of one of the CCC camps near Galva, Illinois.

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